as it seems to ignorant human beings, in hundreds at one small corner only of a roomy island in Scoulton Mere, and Sheerwaters collect to breed in one only of the hundred and fifty islands of the Scilly archipelago. Guillemots, identified by peculiar egg markings, lay year after year, as Yorkshire cliff climbers agree, "within half an inch" of the same spot on the same narrow ledge.

"Water ouzels," writes St. John (p. 55), "come to the burns near the sea about the beginning of October. The same stones are occupied year after year by these birds."

In a Norfolk cover well known to the present writer, if there was a woodcock in the neighbourhood one was almost always to be found under one particular laurel bush.

Surroundings may completely change without breaking the charm. Thickknees love open spaces, and as a rule nest nowhere else. But Prof. Newton, in the article on migration in his "Dictionary of Birds," tells of their eggs laid in a thick Suffolk cover, in the precise spot where years before, when the ground was still an unplanted heath, birds of the species had been accustomed to breed.

The only thing to be objected to in an otherwise altogether charming book is the paper on which it is printed, which is abominable.

The dazzling glaze which makes reading by candlelight a pain instead of a pleasure is too high a price to pay even for St. John's spirited and witty pen and ink sketches.

If the use of the highly pressed and metallically polished papers which, since the invention of "process blocks," have become fashionable in illustrated magazines is carried much farther—the danger is very real and serious—the eyes of the rising generation will fail them long before their time.

There is something pathetic in the thought of the number of men, younger sons of country gentlemen and sons of officers, clergymen and professional men, born with the deepest-seated of aboriginal instincts—the love of sport—ingrained in their natures and brought up among birds' nests and sticklebacks, who find themselves, during the best years of their life, cut off from all that is most congenial to them and their manhood slipping from them in the close atmosphere of towns.

A writer who, like Charles St. John, can while them away from cramping surroundings and keep alive for a little longer the ever-receding dream of the good time to come some day, is not a man who has lived in vain.

T. DIGBY PIGOTT.

EXERCISES IN HYGIENE.

The Science of Hygiene: a Text-book of Laboratory Practice. By Walter C. C. Pakes, D.Ph. (Camb.), F.C.S. Pp. xv + 380. (London: Methuen and Co., 1900.)

"HITHERTO there has appeared no single text-book dealing with all the practical laboratory work which is now required from the candidate for the Diploma in Public Health." So the author writes in his preface, and the work under review is the result of his attempt to remedy what he considers to be "a great disadvantage."

When it is pointed out that in this manual some five subjects are dealt with, each of which has furnished the subject-matter of well-known text-books of similar bulk to the present volume, it is evident that Mr. Pakes's effort must partake somewhat of the nature of a cram book.

"The Science of Hygiene," we would point out, is far too pretentious a title for a small manual which at the most affords the student an incomplete digest of a very extensive branch of study. The inadequacy of treatment would be sufficiently apparent if the different kinds of subject-matter were dealt with in good proportion, but this is not so, for we find the difficult subject of vital statistics disposed of in nineteen pages, ten of which are devoted to the construction of a life table, with the result that no mention is made of one of the most important matters dealt with in vital statistics, namely, the rate of infantile mortality; the subject of physics is dismissed without any mention being made of the siphon or of the common pump, the principles of which should certainly be understood by the public health student; and the great and important matter of the chemical examination of food is dealt with in twenty-eight pages. On the other hand, the part of the work dealing with microscopy covers eighty-nine pages and is by far the most complete and best part of the book.

The work is divided into five parts. Part 1 gives an outline of bacteriology; the brief directions here given are generally sufficient if the worker has the advantage of a teacher at hand when he attempts to put them into practice, otherwise he will frequently find them insufficient. Part 2 deals with microscopy; the illustrations are for the most part good, but the representations of the starches are crude and unsatisfactory. No drawing is given of Cyclops or of Gammarus Pulex, two organisms of far more common occurrence than several of those dealt with by the writer.

In mounting the starches for microscopical examination the student is told to use a "sterilised loop" to moisten the starch with, and a further instance of carelessness is the fact that pages illustrating water sediments are headed "Internal Parasites."

Part 3, which deals with chemistry, also contains blemishes. With reference to the physical characters of water it is said that "if there is any yellowish or brownish colour there will be some suspicion of sewage contamination, unless the water happens to have been collected from a peaty soil." We should have been more disposed to warn the student that it is very rare indeed for sewage contamination, even when it is very considerable, to colour water; iron, on the other hand, is one of the more common causes of such coloration.

In the estimation of chlorides the red precipitate of chromate of silver is described as "brown." The method described for the "estimation of calcium" will include magnesium; and the "estimation of magnesium," when performed in accordance with the directions given, will lead to a very serious under-estimation.

Although the author does not offer "more than a few hints to enable those who are not adepts to avoid the many pitfalls which await them," his remarks upon the interpretation of the results of the analyses of water are faulty in places and would not be acceptable to those

who are most *au courant* with this subject. There are many indefinite statements such as the following: "it may happen that a particular geological stratum contains a considerable excess of chlorine," "some geological strata contain nitrates to some considerable degree," "speaking as a rule to which there are of course notable exceptions, drinking water ought not to contain more than 0·5 part per 100,000 of nitric nitrogen."

It is said that a good deep well water often does not absorb more oxygen from the permanganate solution (in four hours at 27° C.) than 0·001 grm. per 100,000. Surely such deep well waters must be very exceptional.

A sample of upland surface water is given with 0·07 of free ammonia, 0·2 of albuminoid ammonia and 0·12 of oxygen absorbed, and with total solids amounting to 2·8 in parts per 100,000, and one of subsoil water with free ammonia 0·12, albuminoid ammonia 0·033, and oxygen absorbed 0·52, without any indication of the fact that these waters are grossly polluted.

Part 3 also deals with the analyses of sewage, sewage effluents and food. In examining sewage, the student is advised that it often happens when 10 or 20 c.c. of sewage are added to 500 c.c. of ammonia free water, that twelve or fourteen Nessler glasses of distillate are collected before the yield of albuminoid ammonia ceases. This is surely a singular experience. Working at such dilutions and under the directions given by the author, it would be extremely rare that more than five or six Nessler glasses would be required; moreover, fourteen Nessler glasses would hold 700 cubic centimetres of distillate, and how is the student to collect this from only some 500 cubic centimetres of liquid in the boiling flask?

On the subject of food analysis we are informed that analysts of repute obtain the specific gravity of milk by weighing with the specific gravity bottle. If this is so, surely there must be few analysts of repute in this country. The average amount of water in butter is put at 8·55 per cent., which is too low; and it is stated that no butter should be condemned as adulterated with water unless it contains less than 80 per cent. of fat; whereas the limit of water accepted by the Society of Public Analysts is 16 per cent. It is said that "in a normal sample of bread there is as much alum as silica," and that "the weight of silica found must therefore be deducted from the amount of alum found, and any excess will represent added alum." As a matter of fact alum is never found in pure bread, nor is it correct to state that there is as much alumina as silica in normal bread.

That the alcohol of wine and beer is determined exactly as in the case of spirits is a bald statement the insufficiency of which will be manifest to the student when, for instance, he first essays an estimation of the alcohol in beer. Doubtless by a printer's error "the Sinaitic Peninsular" is referred to on p. 152, while the atomic weight of silver is given as 107·7 on p. 191, and as 108·0 in the appendix.

It must be said, then, that the volume is on the whole an unsatisfactory one, in which most of the subjects are dealt with, not only inadequately, but sometimes faultily, owing to the attempt to compress too much matter into too small a space.

The subjects of bacteriology, public health, chemical work, physics and vital statistics have, as a matter of fact, all been dealt with in practical manuals in such a manner that the serious student will not find much use for the book under review.

PUBLIC WATER-SUPPLIES.

Public Water-Supplies: Requirements, Resources, and the Construction of Works. By F. E. Turneaure, C.E., and H. L. Russell, Ph.D. Pp. xiv+746. (New York: John Wiley and Sons, 1901. London: Chapman and Hall, Ltd.)

WATER-SUPPLY is unquestionably one of the most important branches of civil engineering in the present day, owing to the widespread nature of the demands for it, the great value attached to a pure supply, resulting from the progress of sanitary science, and the increasing difficulty, in populous countries, of obtaining an unpolluted and adequate supply. This book has been prepared with the object of supplying the needs of teachers and students in technical schools; and the greater portion of it is based on the experience of the first-named author in teaching the subject for many years, which forms one branch of his courses of lectures in the University of Wisconsin. A novel feature in this volume is the conjunction of an engineer and a chemist in its production, thereby enabling the engineering and bacteriological aspects of the question to be dealt with respectively by very competent experts; whilst a chapter on pumping machinery is contributed by another engineer. Fundamental principles have been given more prominence than details of construction, though these latter have been largely made use of to illustrate the principles involved and differences in the conditions, and a considerable space has been devoted to the quality and purification of water-supplies, constituting such important considerations from a sanitary point of view, and also to the questions connected with ground-water. The comprehensive scope of the book, and its exhaustive, though concise, treatment of the subject are most effectively illustrated by a reference to the headings of the twenty-nine chapters into which the book is divided.

The subject is opened by an introductory chapter giving a very brief historical sketch, from the earliest times, of the development of water-supplies, and a statement of the value and importance of a public water-supply for domestic, commercial and public uses. The book is then divided into two parts, the first dealing with "Requirements and Resources," and the second with "The Construction of Water-Works," in nine and nineteen chapters respectively. The first part is subdivided into two sections, with the respective headings, "Quantity of Water Required: Sources of Supply," and "Quality of Water-Supplies," occupying six and three chapters respectively. The first section comprises the quantity of water required, sources of supply, rainfall, evaporation and percolation, flow of streams, and ground-water; whilst the second section deals with the examination of water-supplies, the quality of water, and communicable diseases and water-supplies. The second part of the book, which is devoted to construction, after two introductory chapters dealing with generalities pertaining to